CENTRAL VALLEY REGIONAL
WATER QUALITY CONTROL BOARD

AMENDMENTS
TO
THE WATER QUALITY CONTROL PLAN FOR THE SACRAMENTO RIVER AND SAN JOAQUIN RIVER BASINS

FOR

THE CONTROL OF DIAZINON AND CHLORPYRIFOS RUNOFF INTO THE LOWER SAN JOAQUIN RIVER

APPENDIX D
SAN JOAQUIN RIVER DIAZINON AND CHLORPYRIFOS ECONOMIC SCENARIOS
FINAL STAFF REPORT

October 2005

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

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———

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———

11020 Sun Center Drive #200
Rancho Cordova, CA 95670

———

Phone: (916) 464-3291
eMail: info5@waterboards.ca.gov
Web site: http://www.waterboards.ca.gov/centralvalley/

DISCLAIMER

This publication is a report by staff of the California Regional Water Quality Control Board, Central Valley Region. This report contains the evaluation of alternatives and technical support for the adoption of an amendment to the Water Quality Control Plan for the Sacramento and San Joaquin River Basins(Resolution No. R5-2005-0138). Mention of specific products does not represent endorsement of those products by the Regional Board.

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REPORT PREPARED BY:

DIANE BEAULAURIER, JOE KARKOSKI, GENE DAVIS, DANNY MCCLURE, MARY MENCONI, MATTHEW MCCARTHY

REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

INTRODUCTION

Appendix D contains a series of tables displaying ranges and total costs for managing pesticide applications to select crops, monitoring and planning alternatives, and costs for applying specific pesticides to select crops in both the dormant and in-season periods. These tables are followed by a list of footnote descriptions for footnotes identified in the Appendix D tables.

Cost Range and Total Costs

Dormant Season costs				**Irrigation season costs**		
Almonds		**COST**		**Almonds**		**COST**
Minimum cost increase	$1	$11,500		Minimum cost increase	$90	$3,312,000
Maximum cost increase	$160	$1,874,500		Maximum cost increase	$118	$4,342,400
Total acres using d &/or c (a)	11,500			Total acres using d &/or c (d)	36,800	
Peach				**Alfalfa**		
Minimum cost increase/decrease	-$14	-$44,800		Minimum cost increase	$60	$570,000
Maximum cost increase	$146	$467,200		Maximum cost increase	$100	$950,000
Total acres using d &/or c (b)	3,200			Total acres using d (d)	9,500	
Apple						
Minimum cost increase/decrease	-$19	-$22,800				
Maximum cost increase	$159	$190,000				
Total acres using d &/or c (c)	1,200					
Dormant cost range				**Irrigation cost range**		
Minimum	-$56,100			Minimum	$3,882,000	
Maximum	$2,532,500			Maximum	$5,292,400	
Monitoring cost range				**Total cost range**		
Minimum	$600,000			Minimum (e)	$4,425,900	
Maximum	$3,100,000			Maximum (f)	$10,924,900	

(a) sum of average annual acres applied for diazinon and chlorpyrifos for 2000-2002 from almond probabilities worksheet, rounded to nearest 100 acres
(b) sum of average annual acres applied for diazinon and chlorpyrifos for 2000-2002 from peaches probabilities worksheet, rounded to nearest 100 acres
(c) sum of average annual acres applied for diazinon and chlorpyrifos for 2000-2002 from apples probabilities worksheet, rounded to nearest 100 acres
(d) average annual use 2000-2002 (in Table 1.4) divided by 2 pounds per acre application rate
(e) Minimum= minimum dormant cost + minimum irrigation cost + minimum monitoring cost
(f) Maximum = maximum dormant cost + maximum irrigation cost + maximum monitoring cost

Alternative #1 Watershed Group estimates working under waiver	
Estimated Water Quality Monitoring Cost	
Number of Sites	
Number of Sampling Days (assumes 12 days each - dormant and irrigation season samplng)	24
% QA/QC Samples	30%
Cost per Sample	$200
Total analytical costs	$37,440
Number of Person-days for sample collection. Assumes 2 person crew can cover 6 sites.	96
Sample collection preparation as a percent of Person-days for sampling.	25%
Total Person-days for Sample Collection & Preparation	120
Cost per Person-day	$150
Sampling personnel cost	$18,000
Travel Costs (400 mi per trip from Sacramento)/ $0.35 per mile.	$3,360
Equipment/Supplies	$20,000
Flow estimates ($100 /site)	$300
Total Sampling Cost	$75,740
Effectiveness Evaluation	
Cost per project	$400,000
Number of projects per year	0.5
Annual surveys of grower implementation	$25,000
Total effectiveness evaluation cost	$225,000
Planning Cost	Person-Months to prepare
Monitoring Plan & QAPP	
Implementation Plan	
Annual Monitoring Report	
Annual Implementation Plan Report	
Monitoring Program Coordination	
Implementation Plan Coordination - Basin-wide	12
Cost per person-month for professional services	$10,000
Total planning cost	$280,000
Total annual cost for basin-wide monitoring, planning, and evaluation	
Total Cost	$580,740
Total Number of Orchard Growers	1000
Cost per Grower	$580.74

Alternative 2 - Individual Discharger Estimates working under waiver	
Estimated Water Quality Monitoring Cost	
Number of Sites	1
Number of Sampling Days (assumes 2 days for either dormant or irrigation season samplng)	2
% QA/QC Samples	30%
Cost per Sample	$200
Total analytical costs	$520
Number of Person-days for sample collection. Assumes 1 person crew.	2
Sample collection preparation as a percent of Person-days for sampling.	25%
Total Person-days for Sample Collection & Preparation	3
Cost per Person-day (assume grower collects)	$0
Sampling personnel cost	$0
Travel Costs (50 mi per trip/ $0.35 per mile.	$35
Equipment/Supplies (Gloves $20 + $20/sample bottle)	$72
Flow Estimate ($100/site)	$100
Total Sampling Cost per site	$692
Total number of sites	1000
Total cost for 1000 sites	$692,000
Effectiveness Evaluation	
Annual farm evaluation	$2,000
Assume - farm evaluation is independent review of farm operations and w.q. data.	
Assume - Regional Board or some other entity prepares standard forms to fill out for monitoring and implementation plan	
Planning Cost	Person-Hours to prepare
Monitoring Plan & QAPP	2
Implementation Plan	4
Annual Monitoring Report	2
Annual Implementation Plan Report	2
Monitoring Program Coordination	0
Implementation Plan Coordination - Basin-wide	0
Cost per person-hours for grower to perform	$40
Total planning cost	$400
Total annual cost for basin-wide monitoring, planning, and evaluation	
Cost per Grower	$3,092
Total Number of Growers	1000
Basin-wide Cost	$3,092,000

Economic Analysis for Dormant Season Chlorpyrifos Base Case and Alternate Scenarios for Cling Peaches (UCCE 1998)								
				Base Case	Alternate Scenario 1(1)	Alternate Scenario 2	Alternate Scenario 3	Alternate Scenario 4
				DO + Chlorpyrifos	DO Alone	DO + Bt at Bloom(2)	DO + Success	DO + Pyrethroid. In-season treatments as needed. Cover crops to reduce runoff.
	Cost of One Application (per ac, based on 100 ac)(a)			$20	$20	$20	$20	$20
	Cost of Two Applications (per ac, based on 100 ac)(a)					$40		
	Supreme Oil (4 gal/ac)(a)			$12	$12	$12	$12	$12
		Diazinon 50 (3.5 lb/ac)(a)	$19/acre					
		Lorsban 4E (2qt/ac)(3)(a)	$15/acre	$15			$15	
		Guthion 50WP (4lbs/ac)(3)(a)	$45/acre					
		Supracide 25 WP (8lbs/ac)(a)	$60/acre					
		Imidan 70 WP (4.25 lbs/ac)(a)	$30/acre	$30	$30	$30	$30	$30
		Asana XL (4-6 oz/ac)(4)(a)	$5/acre					$5
		Ambush 25SP (12-25 oz/ac)(4)(a)	$30/acre					
		Pounce 3.2 EC (8-16 oz/ac)(4)(a)	$23/acre					
		Dipel (1 lb/ac)(2)(a)	$28/acre			$28		
		Trilogy 90EC (2g/ac)(2)(a)	$140/acre					
		Success (6 oz/ac)(a)	$30/acre				$30	
		Sevin 80S (1.25 lb/ac)(a)	$8/acre					
		Vendex 50WP (2 lb/ac)(a)	$56/acre					$56
		Apollo SC (4 oz/ac)(a)	$58/acre					
		Omite 30 WP (7.5 lb/ac)(a)	$45/acre					
	Probability of Needing In-season Applications(b)			0.6	1	0.9	0.9	1
	Cover Crop(c)							$60
	Cultural Costs--Not Including Dormant Sprays (d)			$1,415	$1,415	$1,415	$1,415	$1,415
Total Cultural Costs				$1,477	$1,497	$1,560	$1,537	$1,638
Harvest Costs(d)				$975	$975	$975	$975	$975
Advisory Board Assessment(d)				$47	$47	$47	$47	$47
Interest on Operating Capital @ 10.46%(d)				$45	$45	$45	$45	$45
Cash Overhead(d)				$248	$248	$248	$248	$248
Non-Cash Overhead(d)				$1,125	$1,125	$1,125	$1,125	$1,125
Total Costs				$3,917	$3,937	$4,000	$3,977	$4,078
Gross Revenue(5)(d)				$4,700	$4,700	$4,700	$4,700	$4,700
Returns to Land, Mgt & Overhead				$783	$763	$700	$723	$622
Total Cultural Costs as Percent of Gross Revenue				31%	21%	21%	21%	21%
Total Costs as Percent of Gross Revenue				83%	84%	85%	85%	87%
Change in Total Cost from Base Case				$0	$20	$83	$60	$146
% Change in Total Cost from Base Case				0%	0%	2%	1%	3%

* Imidan (phosmet) and Asana (esfenvalerate) were used for scenario because PUR records indicate they are commonly used on peaches

Economic Analysis for Dormant Season Diazinon Base Case and Alternate Scenarios for Cling Peaches (UCCE 1998)								
				Base Case	Alternate Scenario 1[1]	Alternate Scenario 2	Alternate Scenario 3	Alternate Scenario 4
				DO + Diazinon	DO Alone	DO + Bt at Bloom[2]	DO w/ Success	DO + Pyrethroid. In-season treatments as needed. Cover crops to reduce runoff.
	Cost of One Application (per ac, based on 100 ac)(a)			$20	$20	$20	$20	$20
	Cost of Two Applications (per ac, based on 100 ac)(a)					$40		
	Supreme Oil (4 gal/ac)(a)			$12	$12	$12	$12	$12
		Diazinon 50 (3.5 lb/ac)(a)	$19/acre	$19			$19	
		Lorsban 4E (2qt/ac)(3)(a)	$15/acre					
		Guthion 50WP (4lbs/ac)(3)(a)	$45/acre					
		Supracide 25 WP (8lbs/ac)(a)	$60/acre					
		Imidan 70 WP (4.25 lbs/ac)(a)	$30/acre	$30	$30	$30	$30	$30
		Asana XL (4-6 oz/ac)(4)(a)	$5/acre					$5
		Ambush 25SP (12-25 oz/ac)(4)(a)	$30/acre					
		Pounce 3.2 EC (8-16 oz/ac)(4)(a)	$23/acre					
		Dipel (1 lb/ac)(2)(a)	$28/acre			$28		
		Trilogy 90EC (2g/ac)(2)(a)	$140/acre					
		Success (6 oz/ac)(a)	$30/acre				$30	
		Sevin 80S (1.25 lb/ac)(a)	$8/acre					
		Vendex 50WP (2 lb/ac)(a)	$56/acre					$56
		Apollo SC (4 oz/ac)(a)	$58/acre					
		Omite 30 WP (7.5 lb/ac)(a)	$45/acre					
	Probability of Needing In-season Applications(b)			0.9	1	0.9	0.9	1
	Cover Crop(c)							$60
	Cultural Costs--Not Including Dormant Sprays (d)			$1,415	$1,415	$1,415	$1,415	$1,415
Total Cultural Costs				$1,511	$1,497	$1,560	$1,541	$1,638
Harvest Costs(d)				$975	$975	$975	$975	$975
Advisory Board Assessment(d)				$47	$47	$47	$47	$47
Interest on Operating Capital @ 10.46%(d)				$45	$45	$45	$45	$45
Cash Overhead(d)				$248	$248	$248	$248	$248
Non-Cash Overhead(d)				$1,125	$1,125	$1,125	$1,125	$1,125
Total Costs				$3,951	$3,937	$4,000	$3,981	$4,078
Gross Revenue(5)(d)				$4,700	$4,700	$4,700	$4,700	$4,700
Returns to Land, Mgt & Overhead				$749	$763	$700	$719	$622
Total Cultural Costs as Percent of Gross Revenue				32%	21%	21%	21%	21%
Total Costs as Percent of Gross Revenue				84%	84%	85%	85%	87%
Change in Total Cost from Base Case				$0	-$14	$49	$30	$127
% Change in Total Cost from Base Case				0%	0%	1%	1%	3%
* Imidan (phosmet) and Asana (esfenvalerate) were used for scenario because PUR records indicate they are commonly used on peaches								

Economic Analysis for Dormant Season Chlorpyrifos Base Case and Alternate Scenarios for Apples (UCCE 2001a)								
				Base Case	**Alternate Scenario 1**	**Alternate Scenario 2**	**Alternate Scenario 3**	**Alternate Scenario 4**
				DO + Diazinon	DO Alone	DO + *Bt* at Bloom(2)	DO + Success	DO + Pyrethroid. In-season treatments as needed. Cover crops to reduce runoff.
	Cost of One Application (per ac, based on 100 ac)(a)			$20	$20	$20	$20	$20
	Cost of Two Applications (per ac, based on 100 ac)(a)					$40		
	Supreme Oil (4 gal/ac)(a)			$12	$12	$12	$12	$12
		Diazinon 50 (3.5 lb/ac)(a)	$19/acre					
		Lorsban 4E (2qt/ac)(3)(a)	$15/acre	$15				
		Guthion 50WP (4lbs/ac)(3)(a)	$45/acre					
		Supracide 25 WP (8lbs/ac)(a)	$60/acre					
		Imidan 70 WP (4.25 lbs/ac)(a)	$30/acre	$30	$30	$30	$30	$30
		Asana XL (4-6 oz/ac)(4)(a)	$5/acre					
		Pounce 3.2 EC (8-16 oz/ac)(4)(a)	$23/acre					$23
		Dipel (1 lb/ac)(2)(a)	$28/acre			$28		
		Trilogy 90EC (2g/ac)(2)(a)	$140/acre					
		Success (6 oz/ac)(a)	$30/acre				$30	
		Sevin 80S (1.25 lb/ac)(a)	$8/acre					
		Vendex 50WP (2 lb/ac)(a)	$56/acre					$56
		Apollo SC (4 oz/ac)(a)	$58/acre					
		Omite 30 WP (7.5 lb/ac)(a)	$45/acre					
	Probability of Needing In-Season Application(b)			1.00	1.00	1.00	1.00	1.00
	Cover Crop(c)							$60
	Cultural Costs--Not Including Dormant Sprays(d)			$1,332	$1,332	$1,332	$1,332	$1,332
Total Cultural Costs				$1,429	$1,414	$1,482	$1,444	$1,573
Harvest Costs per acre(d)				$1,740	$1,740	$1,740	$1,740	$1,740
Processing Costs per acre(d)				$6,915	$6,915	$6,915	$6,915	$6,915
Advisory Board Assessment(d)				$120	$120	$120	$120	$120
Interest on Operating Capital @10.51%(d)				$151	$151	$151	$151	$151
Cash Overhead(d)				$202	$202	$202	$202	$202
Non-Cash Overhead(d)				$1,131	$1,131	$1,131	$1,131	$1,131
Total Costs				$11,688	$11,673	$11,741	$11,703	$11,832
Gross Revenue(5)(d)				$15,300	$15,300	$15,300	$15,300	$15,300
Returns to Land, Mgt & Overhead				$3,612	$3,627	$3,559	$3597	$3,468
Total Cultural Costs as Percent of Gross Revenue				9%	9%	10%	9%	10%
Total Costs as Percent of Gross Revenue				76%	76%	77%	76%	77%
Change in Total Cost from Base Case				$0	-$15	$53	$15	$159
% Change in Total Cost from Base Case				0%	0%	1%	0%	1%
* Imidan (phosmet) and Pounce (permethrin) were used for scenarios because they are commonly used on apples								

Economic Analysis for Dormant Season Diazinon Base Case and Alternate Scenarios for Apples (UCCE 2001a)							
			Base Case	**Alternate Scenario 1**	**Alternate Scenario 2**	**Alternate Scenario 3**	**Alternate Scenario 4**
			DO + Diazinon	DO Alone	DO + *Bt* at Bloom(2)	DO + Success	DO + Pyrethroid. In-season treatments as needed. Cover crops to reduce runoff.
	Cost of One Application (per ac, based on 100 ac)(a)		$20	$20	$20	$20	$20
	Cost of Two Applications (per ac, based on 100 ac)(a)				$40		
	Supreme Oil (4 gal/ac)(a)		$12	$12	$12	$12	$12
	Diazinon 50 (3.5 lb/ac)(a)	$19/acre	$19				
	Lorsban 4E (2qt/ac)(3)(a)	$15/acre					
	Guthion 50WP (4lbs/ac)(3)(a)	$45/acre					
	Supracide 25 WP (8lbs/ac)(a)	$60/acre					
	Imidan 70 WP (4.25 lbs/ac)(a)	$30/acre	$30	$30	$30	$30	$30
	Asana XL (4-6 oz/ac)(4)(a)	$5/acre					
	Pounce 3.2 EC (8-16 oz/ac)(4)(a)	$23/acre					$23
	Dipel (1 lb/ac)(2)(a)	$28/acre			$28		
	Trilogy 90EC (2g/ac)(2)(a)	$140/acre					
	Success (6 oz/ac)(a)	$30/acre				$30	
	Sevin 80S (1.25 lb/ac)(a)	$8/acre					
	Vendex 50WP (2 lb/ac)(a)	$56/acre					$56
	Apollo SC (4 oz/ac)(a)	$58/acre					
	Omite 30 WP (7.5 lb/ac)(a)	$45/acre					
	Probability of Needing In-Season Application(b)		1.00	1.00	1.00	1.00	1.00
	Cover Crop(c)						$60
	Cultural Costs--Not Including Dormant Sprays(d)		$1,332	$1,332	$1,332	$1,332	$1,332
Total Cultural Costs			$1433	$1,414	$1,482	$1,444	$1,573
Harvest Costs per acre(d)			$1,740	$1,740	$1,740	$1,740	$1,740
Processing Costs per acre(d)			$6,915	$6,915	$6,915	$6,915	$6,915
Advisory Board Assessment(d)			$120	$120	$120	$120	$120
Interest on Operating Capital @10.51%(d)			$151	$151	$151	$151	$151
Cash Overhead(d)			$202	$202	$202	$202	$202
Non-Cash Overhead(d)			$1,131	$1,131	$1,131	$1,131	$1,131
Total Costs			$11,692	$11,673	$11,741	$11,703	$11,832
Gross Revenue(5)(d)			$15,300	$15,300	$15,300	$15,300	$15,300
Returns to Land, Mgt & Overhead			$3,608	$3,627	$3,559	$3,597	$3,468
Total Cultural Costs as Percent of Gross Revenue			9%	9%	10%	9%	10%
Total Costs as Percent of Gross Revenue			76%	76%	77%	76%	77%
Change in Total Cost from Base Case			$0	-$19	$49	$11	$159
% Change in Total Cost from Base Case			0%	0%	0%	0%	1%
* Imidan (phosmet) and Pounce (permethrin) were used for scenarios because they are commonly used on apples							

Economic Analysis for Dormant Season Diazinon Base Case and Alternate Scenarios for Almonds (UCCE 2002a)								
				Base Case	**Alternate Scenario 1[1]**	**Alternate Scenario 2**	**Alternate Scenario 3**	**Alternate Scenario 4**
				DO + Diazinon	DO Alone	DO + *Bt* at Bloom[2]	DO w/ Success	DO + Pyrethroid. In-season treatments as needed. Cover crops to reduce runoff.
	Cost of One Application(per ac, based on 100 ac)(a)			$20	$20	$20	$20	$20
	Cost of Two Applications(per ac, based on 100 ac)(a)					$40		
	Supreme Oil(4 gal/ac)(a)			$12	$12	$12	$12	$12
		Diazinon 50 (3.5 lb/ac)(a)	$19/acre	$19				
		Guthion 50WP (4lbs/ac)(3)(a)	$45/acre					
		Supracide 25 WP (8lbs/ac)(a)	$60/acre					
		*Imidan 70WP (4.25 lb/ac)(a)	$30/acre	$30	$30	$30	$30	$30
		Ambush 25SP (12-25 oz/ac)(4)(a)	$30/acre					
		*Pounce 3.2 EC (8-16 oz/ac)(4)(a)	$23/acre					$23
		Dipel (1 lb/ac)(2)(a)	$28/acre			$28		
		Success (6 oz/ac)(a)	$30/acre				$30	
		Sevin 80S (1.25 lb/ac)(a)	$8/acre					
		Vendex 50WP (2 lb/ac)(a)	$56/acre					$56
		Apollo SC (4 oz/ac)(a)	$58/acre					
		Omite 30 WP (7.5 lb/ac)(a)	$45/acre					
	Probability of Needing In-season Applications(b)			0.60	1.00	0.60	0.60	1.00
	Cover Crop(c)		$60/acre					$60
Cultural Costs--Not Including Dormant Sprays(d,e)				$1,000	$1,000	$1,000	$1,000	$1,000
Total Cultural Costs				$1,081	$1,082	$1,110	$1,092	$1,241
Harvest Costs per acre(d)				$332	$332	$332	$332	$332
Interest on Operating Capital @7.4%(d)				$24	$24	$24	$24	$24
Cash Overhead(d)				$214	$214	$214	$214	$214
Non-Cash Overhead(d)				$1,098	$1,098	$1,098	$1,098	$1,098
Total Costs				$2,749	$2,750	$2,778	$2,760	$2,909
Gross Revenue (5)(d)				$2,500	$2,500	$2,500	$2,500	$2,500
Returns to Land, Mgt & Overhead				-$249	-$250	-$278	-$260	-$409
Total Cultural Costs as Percent of Gross Revenue				0.43	0.43	0.44	0.44	0.50
Total Costs as Percent of Gross Revenue				110%	110%	111%	110%	116%
Change in Total Cost from Base Case				$0	$1	$29	$11	$160
% Change in Total Cost from Base Case				0%	0%	1%	0%	6%
* Imidan (phosmet) and Pounce (permethrin) were used for scenario because PUR records indicate they are commonly used on almonds								

Economic Analysis for Dormant Season Chlorpyrifos Base Case and Alternate Scenarios for Almonds (UCCE 2002a)								
				Base Case	**Alternate Scenario 1[1]**	**Alternate Scenario 2**	**Alternate Scenario 3**	**Alternate Scenario 4**
				DO + Chlorpyrifos	DO Alone	DO + *Bt* at Bloom[2]	DO + Success	DO + Pyrethroid. In-season treatments as needed. Cover crops to reduce runoff.
	Cost of One Application(per ac, based on 100 ac)(a)			$20	$20	$20	$20	$20
	Cost of Two Applications(per ac, based on 100 ac)(a)					$40		
	Supreme Oil(4 gal/ac)(a)			$12	$12	$12	$12	$12
		Lorsban 4E (2qt/ac)(3)(a)	$15/acre	$15				
		Guthion 50WP (4lbs/ac)(3)(a)	$45/acre					
		Supracide 25 WP (8lbs/ac)(a)	$60/acre					
		*Imidan 70WP (4.25 lb/ac)(a)	$30/acre	$30	$30	$30	$30	$30
		Ambush 25SP (12-25 oz/ac)(4)(a)	$30/acre					
		Pounce 3.2 EC (8-16 oz/ac)(4)(a)	$23/acre					$23
		Dipel (1 lb/ac)(2)(a)	$28/acre			$28		
		Success (6 oz/ac)(a)	$30/acre				$30	
		Sevin 80S (1.25 lb/ac)(a)	$8/acre					
		Vendex 50WP (2 lb/ac)(a)	$56/acre					
		Apollo SC (4 oz/ac)(a)	$58/acre					
		Omite 30 WP (7.5 lb/ac)(a)	$45/acre					$45
	Probability of Needing In-season Applications(b)			0.40	1.00	0.60	0.60	1.00
	Cover Crop(c)		$60/acre					$60
Cultural Costs--Not Including Dormant Sprays(d,e)				$1,000	$1,000	$1,000	$1,000	$1,000
Total Cultural Costs				$1,067	$1,082	$1,110	$1,092	$1,230
Harvest Costs per acre(d)				$332	$332	$332	$332	$332
Interest on Operating Capital @7.4%(d)				$24	$24	$24	$24	$24
Cash Overhead(d)				$214	$214	$214	$214	$214
Non-Cash Overhead(d)				$1,098	$1,098	$1,098	$1,098	$1,098
Total Costs				$2,735	$2,750	$2,778	$2,760	$2,898
Gross Revenue (5)(d)				$2,500	$2,500	$2,500	$2,500	$2,500
Returns to Land, Mgt & Overhead				-$235	-$250	-$278	-$260	-$398
Total Cultural Costs as Percent of Gross Revenue				43%	43%	44%	44%	49%
Total Costs as Percent of Gross Revenue				109%	110%	111%	110%	116%
Change in Total Cost from Base Case				$0	$15	$43	$25	$163
% Change in Total Cost from Base Case				0	1	2	1	6
* Imidan (phosmet) and Pounce (permethrin) were used for scenario because PUR records indicate they are commonly used on almonds								

Economic Analysis for Irrigation Season Chlorpyrifos (Base Case) and Alternate Scenarios for Almonds. (UCCE 2002a, 2002b)						
Chlorpyrifos applied in-season (July) to control Naval Orange Worm			**Base Case**	**Alternate Scenario 1**	**Alternate Scenario 2**	**Alternate Scenario 3**
			Chlorpyrifos 60% of growers use basin flood irrigation with berms, 40% use drip or microsprinkler	Orchard sanitation + *Bt* at hull split. Same irrigation as Base Case	Guthion Same irrigation as Base Case, cover crops to reduce runoff	Chlorpyrifos 100% of growers use drip or microsprinklers to reduce runoff.
	Cost of One Application(per ac, based on 100 ac)(a)		$20		$20	$20
	Cost of Two Applications(per ac, based on 100 ac)(a)			$40		
	Lorsban 4E (2qt/ac)(3)(a)	$15/acre	$15			$15
	Guthion 50WP (4lbs/ac)(3)(a)	$45/acre			$45	
	Imidan 70WP (4.25 lb/ac)(a)	$30/acre				
	Asana XL (4-6 oz/ac)(4)(a)	$5/acre				
	Dipel (1 lb/ac)(2)(a)	$28/acre		$28		
	Orchard sanitation©	$70/acre		$70		
	Cover Crop(c)	$60/acre			$60	
	Microsprinklers cost differential	$196/acre/year	$196	$196	$196	$196
Cultural Costs--Not Including management variable(d)			$1,000	$1,000	$1,000	$1,000
Total Cultural Costs			$1,113	$1,216	$1,203	$1,231
Harvest Costs per acre(d)			$332	$332	$332	$332
Interest on Operating Capital @7.4%(d)			$24	$24	$24	$24
Cash Overhead(d)			$214	$214	$214	$214
Non-Cash Overhead(d)			$1,098	$1,098	$1,098	$1,098
Total Costs			$2,781	$2,884	$2,871	$2,899
Gross Revenue (5)(d)			$2,500	$2,500	$2,500	$2,500
Returns to Land, Mgt & Overhead			-$281	-$384	-$371	-$399
Total Cultural Costs as Percent of Gross Revenue			45%	49%	48%	49%
Total Costs as Percent of Gross Revenue			111%	115%	115%	116%
Change in Total Cost from Base Case			$0	$103	$90	$118
% Change in Total Cost from Base Case			0%	4%	3%	4%
Guthion (azinphos-methyl) was used for scenario because it was first on list of alternatives from UCIPM guidelines.						
Pyrethroid scenario was not included becaue pyrethroids are not recommended for in-season use on almonds.						

Economic Analysis for Irrigation Season Chlorpyrifos (Base Case) and Alternate Scenarios for Alfalfa. (UCCE 2003)					
Chlorpyrifos applied in-season (March) to control Egyptian Alfalfa Weevil			**Base Case**	**Alternate Scenario 1**	**Alternate Scenario 2**
			Chlorpyrifos Flood irrigation, no tailwater control or vegetated buffer	Same irrigation as Base Case, tailwater control to reduce runoff	Same irrigation as Base Case, vegetated buffer to reduce runoff
	Cost of One Application (per ac, based on 100 ac)(a)	$20/acre	$20	$20	$20
	Cost of Two Applications (per ac, based on 100 ac)(a)	$40/acre			
	Lorsban 4E (2qt/ac)(3)(a)	$15/acre	$15	$15	$15
	Ambush 25SP (12-25 oz/ac)(4)(a)	$30/acre			
	Imidan 70WP (4.25 lb/ac)(a)	$30/acre			
	Vegetated Buffer(c)	$60/acre			$60
	Tailwater control (Surface Drainage recirculation)(f)	$100/acre/year		$100	
Cultural Costs--Not Including management variable(d)			$290	$290	$290
Total Cultural Costs			$325	$425	$385
Harvest Costs per acre(d)			$198	$198	$198
Interest on Operating Capital @7.14%(d)			$9	$9	$9
Cash Overhead(d)			$77	$77	$77
Non-Cash Overhead(d)			$400	$400	$400
Total Costs			$1,009	$1,109	$1,069
Gross Revenue (5)(d)			$875	$875	$875
Returns to Land, Mgt & Overhead			-$134	-$234	-$194
Total Cultural Costs as Percent of Gross Revenue			37%	49%	44%
Total Costs as Percent of Gross Revenue			115%	127%	122%
Change in Total Cost from Base Case			$0	$100	$60
% Change in Total Cost from Base Case			0%	10%	6%

Explanations and Footnotes for Tables 1 through 5

1) **May result in unacceptable level of damage**
2) **Two applications required--cost is for two applications**
3) **One to three applications required when used as an in-season treatment; cost is for one application**
4) **Choice of this pesticide will also probably require use of miticide such as Vendex, Apollo, Omite, Kelthane, Agri-Mek**
5) **Yield for almonds: 1 ton per acre Price per ton: $2500**
   Yield for peaches: 20 tons per acre Price per ton: $235 Cost data are for 1998 (except advisory board assessment), an inflation rate of 3% was applied to all costs. Yield, price, and advisory board assessment data are for 2003 (R. Duncan, pers.comm)
   Yield for apples: 30 tons per acre Price per ton: $510 (70% fresh, 20% peelers, 10% juicers)

a) **Costs are from Zalom, et al., 1999.**
b) **Estimated probability is based on CDPR Pesticide Use Report data, 2000-2002, when possible. No probabilities could be obtained for apple. Probabilities for dormant oil alone, dormant oil plus Bt, and dormant oil plus spinosad on almond and peach could not be obtained from PUR data. Probabilites were estimated for these scenarios.**
c) **Costs are from Thomas, F. CERUS Consulting. Personal Communication**
d) **Costs for typical practices are from University of California Cooperative Extension --see citations below. Specific practices vary by crop.**
   "Cultural Costs--Not Including Management Alternative(s)" includes annual cost per acre for typical cultural practices such as irrigation using flood system, pruning, fertilization, pollination, leaf analysis, non-dormant season insect pest control, vertebrate pest, weed, and disease control, vehicle use, and consultant fees. It does not include the cost of the management alternative being compared in the scenario, e.g., a specific pesticide.
   "Harvest Costs" include shaking, raking, sweeping, pickup and haul, hull and shell, bin distribution, hand picking, and field sorting, depending on the crop type.
   "Processing Costs" include cooling, sorting, packing, and storing. These costs apply to apples only.
   "Advisory Board Assessment" is a mandatory fee assessed on each ton harvested. Not all crops are assessed an advisory board fee.
   "Interest on Operating Capital" is based on cash operating costs and is calculated monthly until harvest at a yearly rate that varies by crop.
   "Cash Overhead" are expenses assigned to the whole farm, including office expense, liability insurance, sanitation fees, property taxes, insurance, and equipment repairs.
   "Non-Cash Overhead" includes buildings, fuel tanks, shop and hand tools, irrigation pump, filter, and sprinklers, land, and orchard establishment costs.
e) **Includes cost of removing mummies for control of Naval Oranage Worm in almonds ($70 per acre).**
(f) **Cost estimated as annualized capital cost of $45 plus annual maintenance cost of $55. Annualized capital cost = $812 capital cost/18year life expectancy.**
   "Gross Revenues" is the price paid per ton, times the number of tons typically harvested per acre. Tons per acre and price per ton for each crop is identified in (5), above.
   "Returns to Land, Management, and Overhead" is the difference between Gross Revenues and Total Costs per acre.

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UCCE. 1998. Sample Costs to Establish a Cling Peach Orchard and Produce Cling Peaches. Sacramento and San Joaquin Valleys. Flood Irrigation.
UCCE. 1991. Apricot Establishment and Production Costs for the Northern San Joaquin Valley - 1991.

Note: UCCE 2001b was used instead of an older cost study for dried plums in the San Joaquin Valley because the data in UCCE 2001b are more recent.
UCCE 1998 was used instead of a more recent cost study for fresh market peaches in the San Joaquin Valley because canning (cling) peaches represent a larger part of the acreage.